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Resting buds as indices of ecological types.—RAUNKIAER[13] has regarded the world of vegetation from a somewhat new view-point, and has developed some ideas that seem of great value. Prevailing ecological classifications have commonly divided vegetation into xerophytic, mesophytic, and hydrophytic groups, in which the foliage organs have been the dominant element. RAUNKIAER thinks that the most rigorous season to which a plant is subjected is the one which should show the most critical ecological structures. Hence he proposes a new classification, based on resting buds and other organs that are most in evidence in rigorous seasons. On this basis five great plant classes are recognized: phanerophytes, whose buds are considerably above the ground (trees and shrubs); chamephytes, whose buds are slightly above the ground; hemicryptophytes, whose buds are at the ground level; cryptophytes, whose buds are hidden in the ground; and therophytes, whose buds persist only in seeds (annuals). The phanerophytes, especially, may be much subdivided: according to size into mega-, meso-, micro-, and nanophanerophytes; according to leaf-fall habit into evergreen and periodically deciduous; according to bud structure into forms with naked or scaly buds. Chamephytes may have stems that are erect in favorable seasons, or stems that are always horizontal. Cryptophytes are divided into geophytes, helophytes (marsh plants), and hydrophytes; geophytes are further subdivided into rhizome, bulb, root-tuber geophytes, etc. The author remarks on the distribution of these various types in relation to soil and climate. It is his idea that the classification of plant formations can be more readily and scientifically accomplished by the recognition of the above types than on other lines. The reviewer feels that the contribution is of great value, and that perhaps RAUNKIAER has given us the most practical classification of vegetation forms we yet have. It seems a pity, however, that the paper is cumbered with so many new terms. For instance, why say therophyte for annual? Too often good ideas are buried under a ponderous Greek or Latin terminology.—HENRY C. COWLES.

Antitoxic value of complete and of incomplete foods.—LE RENARD[14] has undertaken to ascertain how *Penicillium glaucum* can grow in such concentrated solutions of the salts of copper, and also how the resistance of the organism to the toxic salt is modified by varying conditions of nutrition. The maximum concentration of four salts of copper (sulfate, nitrate, chlorid, and acetate) which will allow germination in the presence of complete and incomplete foods has been determined. A complete food contains the eight essential elements according to the empirical formula $C_6H_{12}O_6+NH_4NO_3+MgSO_4+KH_2PO_4+H_2O$. An incomplete food is one whose corresponding empirical formula is deficient. Fully one-half of the paper is devoted to literature, general biology, and physiology of Penicillium, together with a long discussion of the nature of toxicity.

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[13] RAUNKIAER, C., Types biologiques pour la géographie botanique. Bull. Acad. Roy. Sci. Lett. Danemark 1905:347–437.

[14] LE RENARD, ALF., Essai sur la valeur antitoxique de l'aliment complet et incomplet. 8vo. pp. 1–211. Paris: J. Mersch. 1907.

The author draws thirty distinct conclusions, only a few of which can be noted here. A mineral salt used alone in normal or less than normal concentration does not increase the resistance of the fungus to copper salts, and therefore has no antitoxic value. Carbohydrates in the presence of a suitable mineral salt are antitoxic to an extent which for a constant quantity of that salt becomes zero at about centinormal for the aldoses, but reaches much lower for the ketoses and hexoses. The antitoxic action of a food seems to be correlated with a composition which includes a suitable carbon compound and a suitable mineral salt, united with an organic or a mineral acid. Such a combination the author designates a "complex" in which the toxin and the antitoxin are present in proportions which make a simple ratio representing a double compound (organo-metallic) which suggests by its composition and modifications the side-chain of EHRLICH. The germination of Penicillium in toxic solutions of copper is therefore to be attributed to the presence of such a complex. The paper is really an elaborate study of undoubted value, but the reviewer has not undertaken to digest the evidence for the conclusions enumerated.—RAYMOND H. POND.

Chemistry of fertilization.—LOEB'S address before the International Zoological Congress[15] is of general physiological interest. Summarizing all the experiments on artificial parthenogenesis, he says:

> It seems that the essential feature of the process of fertilization consists first in a liquefaction or hydrolysis or both, of fatty compounds, and second, in the starting of processes of oxidation in the right direction. These processes of liquefaction of fats and hydrolysis and oxidation form apparently the basis of the synthesis of nucleins. It is possible, but far from proved, that among the fatty compounds involved in the process of hydrolysis are the lecithins.
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> These results are in harmony with the facts observed in the germination of oily seeds. The process of germination is an analogue to the starting of the development in the animal egg, inasmuch as resting cells are thrown into the process of cell division and this process is based upon the synthesis of nucleins. . . . . I think the chemistry of the germination of seeds is essentially the chemistry of nuclein synthesis, and I believe the method of starting this synthesis is essentially the same as in the fertilization of the egg. . . . . I am of the opinion that this mechanism of nuclein synthesis is the thread by which we can find a rational way through the maze of the otherwise bewildering mechanisms, characteristic of living matter; on one hand, the phenomena of growth, on the other, those of self-preservation. . . . . We must therefore conclude that the nuclei themselves or one of their constituents are the catalyzer for the nuclein synthesis or one phase of it. It is possible that the nucleus catalyzes only the phenomena of oxidation, and inasmuch as oxidations are the *conditio sine qua non* of nuclein synthesis, this would explain the autocatalytic effect of the nuclei upon this reaction.

It will be difficult to harmonize with this theory the germination of rice seed which, according to TAKAHASHI, germinate in the absence of oxygen, and the anaerobic growth of young shoots, described by NABOKICH.—C. R. B.

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[15] Science N. S. **26**:425–437. 1907.